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1. Title of the Invention:

Air sterilization and purification apparatus

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1 set

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Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a

built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be alternated, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood, from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of $1040 \pm 10\%$) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next,

the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd. Agent: Hiraki MIURA [seal]

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1. 海黄白名林 医克莱克氏试验检检 1. 海黄白名林 医克莱克氏试验检

本 k 4bke 表现是从数 20 4 60 5 5 m 做 张

英国の試験批准

(1) 男和帝(2) 国 南(4) 国 南(4) 国 南(4) 国 南(4) 医高原木



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2、有明日右称 空流数据对计数位 2、新数据字系统图

3、分野日本の単位

高の世界を以えられた丹は中の人人に人士。可 門ナスは城市と協議をもうようにした立以を予生 質にかいて、上記四門する電面側を通道するが以 の何れが母を延れませ、水の故事の場所がを選れ をせることによって、別は男会で対ちせるから記 体を発力をしめるようにしたことを呼吸とする立 気状は皆がが代。

3、我明心神经女武师

本語の情報は、空気被関係の異性に関し、異反
中のよんじんを確認なにより表現せしめる関係成
を対するととのできる
を検に関し、よくに表現で一般単純を表別のから
からなり、海洋を生物とよりはい気変性を以て皮 使なれ、水の穴を検に使れ、よりよいを持分長を 得るどとのできる役割或貨物を収されたとする ものである。

我母女工业的最大化级好。 专物法教教师化业人

修 日本国共計庁

公開特許公報

●特別昭 51-900万元 ●公開日 昭51. (1976) 8. 6 回付開昭 Fo- 160 Po ●出願日 昭か. (1975) 之. 6 審査請求 有 (全5頁)

砂日本分類

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ラロタ チノ

DIALCIA BOSC S/4P

そとで、実集中の容が角質を除会して特を作の ための項数が個人実施すれ、そのいくつかは単立 の現実がだかいて何とは、認為思考を思いか成分 に提成するものかとびかな質的個によう気力を反 せしかふもの又は表別が表別い表別が及を関する ななれのに何のセナンの概要の仏上記がは何のよ かせ辞合によつて有名的式を依式せんとする点式 ボモゼれている。

女命、並是各位权利用於名(被抗の知识权、利 允此、初、空深入口水乡尽入它北大里深水足器就 を通つて、利其可に可能是无用知る北京会域の用於 質問を、門質の用りを支配しまぶら湯道するとう にした城の刀を利用する異常、件、上数の初度化 かいて、門似の外別別に知って始河内に別し始め した現内別を相关、空水水との門外別時間の特定 特を適遇する間に四径深過を考えられるようだし 欠業の方を利用する到底の成果があれている。

血田の気帯は、質量気の最別方と強の刀との全 微観を削き着つまるのであるが、強大的別項は 例に11までの高端を母帯し、が入数値を使用 をせる母母、生気の成派に2つては原帯が状にこ つで観度者はを生じ、利其に長少された人心とん もの何に大河東はを止じ、しばしばほどのかそん がある。プスオソンの得生気をガスレオソン臭を成 的前皮上がしくまん、又しばしば皮吹を生する場 のた点をあれるよったので明確化が開せてもつた

於して、何は世界方で女文師世界を形成立名とと が正式の現立の現立の現立とは の別でする男子となっての現立のでの現立とは の別では、近れれのには、近れれのには のには、近れれののが、近れれのには がなれるでは、近れれののになった。 のには、近れかのには、 がなってといいないのででは、 がなっている。 のには、近れかのは、 がなっている。 のには、 のにな、 のには、 のに

改大・行行を対している大学者の対応を発しく成成・・

京文 1 · 田尺かいて、カロのにより外の文才して東京のおおはははのを入える西の大平からまる東京を付に、スックングを日の七枚をし、在ハッ

₩KJ #351--58 877 (2)

81 化九十、三万众外头が红骨大口尸果上后众 知切灸祭民工る欠点を思慮機強し、さら民命心水 **爪長れ、ふんじんら貝の台下を一ゼスカるととの** でもるのはもおはしたもので、ファンセートル。 第世トランスを内容しその何に対点した円内なる - 丸の気に点井し九八匹・ヤッツ、所もしたお母 · 电电子设置器长用口载电影台(K) 其上名称之人 タサングから書戻され、上万人日本と洋入される 昆虫用口点人也无意。 点力词把的设在非元英程于 イツアの食品がも見過する際。早の世界を与えら 八、在从写九大外的包装是是白金化加热与九元的 日曜在日の日曜日下日ナル。 今年日曜成末下よつ ておおけられば中のかんのかが、「はなっておける。 せしめる最繁を兵するもので、 しゃべつては何男 の羽衣だより、双向する可信は、数点の平行長官 と双型のが四級個人は日本英雄をおえる作品と、 D 它可谓的平疗技术と数据的的角状形式 以助出 被握但又不好对点を。その行為の中国質質又成例 海轨城之。外势の四曲英雄又战众组织前之北梁定

グング穴内内の下方面の出血器に、対気を(ご)を 处计元进行收回电脑定心大机制关环切完仪也。于 のよ万年にファンゼートル前を月刊した着は大分 . からでスタートルデヤップ付をおせし、アプレセ っちへ付し 実材の化化及ストルクユリモラ 太よ か ゴボスてい、) そな可に母妹するととシェび、 ピ 也一人大十七岁了创业保证部件代证或代标的认为 米のトランス (13) を行写し、例念に景度疾患 (18) と早日共享 (19) 人士政治的代表基础推步先令成.0 月後電板 (34) を共転トランネの蚤の点の中央して とし収集のお何文人員(DAL CLA) を長申した品作品 株大らでふり質やマップ (M) も度をして、 はゃ。マ マスitel ドリミストグルスア (37)を行気し大金属 ロ英氏でクップ (は)をおせい、 オモトランスの火 の名に四朝大スととからび、日路外株公前のO上 双非印印电卖用,四时长。 水河南部松青荒黄道 (10)。 支持有权益 (DI) と世界旧称化交互化物が大会長の。 八貫可威(10)を担めして、その音楽共享(10)かり 製成医 (24) 0 前部資品 (四) チャエ仮字の日前室間

f以) 医克森氏线 (2D) 电影用作品 (7D) 医医扩充缺陷 ナるようだなだかめして、力が地点 (34) と対点で 七て異なし大正、そのよび河口をに乗ぶる おおを 共走、下側ドリミフトスインテロ界を報付 (仏)モ 分布丁马西城市农产与农西州及以 (23) 老星提し、 表 化財配支法規約水原がしたハッジング負責目の 上方向日本共興初報 (四) ビーナチング (四) 七枚数 し、そう上才の日本代刊は神之智(1901 を後級し大 上。元曰上軍命日間に成成隊 (be) 七歳けかるび間 關制 (20) 全分供与大公休息付中与双马延数据 (20) ただせし、ボールト DSI を含して対人を(es) と話 ・ 終し、付別目的もらしゅ、ファンキートル何を作 中の際、黒鬼は異なる(四)かとび州之東(四)の東 以歌 (P) かとび時 (ES) とり、円、外回平面同七流 新毛。养久报 (erf。内的公园市外区代析权士马尔 攻とする。

その収、名使シフンス (20) 「専用的には、入力 収配力。 6、1007、田刀収収か、 6、727 ・デボス UN。」と解釈とを別に載けたスインテ による選択するは、導入なれる選集中のよんせん

上於丙年也の城市於於中心で、相口與该門を して。計算可服 (34) の場由其首 (35) の上級 司を成 多数民意服務展析 (35) (32) (4 尼北 不同の以為十上が、 程限所謂者の状元を失之し、対成京太七一原形局 化するとともに有らに、故康由其首は (35), [35] に る故 (35) を経緯して普及常常を由長する信息とす。 ぶたともできる。(4 化7 作)

可多长又、別の表達的として、外類或故(以) 化一次配偶化からて成本を見る財政政 (以) を成分 " 即可吸收化下皮肉化からて成为及或避害最高(如) を被け、再使激励组队前 (以) を実工化 " 包裹 どもして付付させ、皮部の方的政策、成功期間の変化をとう也能なせ、文質型質の存储。並使、明如此化とえる政権用時間をよう行其テスと " たんでも 2 。 (你 e w)

東に、外側を低当に見がされたふださんの歌楽 にはつては、対象は印象(01) からり出し、別が行 えず(00) シェビハッグング(07) を列上げて成り出 した上心がある(20) たらくに代別を取(20) を列を 使き時間しただ。異状になしておむするでもから 保別 成51-30972 (3) は、及便ママング (32) の母はたみいてきの母にお ・何され、月外間は女性だかいてするはなによりま ・の母におきした四日世紀 (34) だ反乗さんがおせん (33) に吸引されたの仮質に異切される。

との前、門間電塔 (34) 代表サ大衆区域第 (29) & M (20) と日神気 F [22] とだまつて、足丸の油基ナ **高级民命办。 6本名法文法立即股份股份股份** 两心根据部(刘州切托政河场城口电视城市 tiple。 (20) 心路解抗射 3 4 次。并属电缆 (2) 心及状丛层 (22) 上月前電氣(14) の電電製器(123) 上の何能社長 1. 4 %。 共成《福 (m) 少四角製料 (和) 七四首宝岩 1341 の最高英雄 (32) との異常をおます先とすると E、同类中国外共富 (m) 依在汽车、母田共高 (fix) はくろうとするにとおはてしい。 1 ロボボによづ て長河水火質し、女小の羽以其末を非長ナるの名 上出身。也就长上口亡会成款然口程在口怀谛、忽 化黑い位置设置电影电影电影电影 医耳口切迹 医乳液 作用時間の延長水場でられた延伸器 七揚げ しゅる 湖水及ナス。(36 0 18)

わりて西瓜を見てみる。 との成材人で (20) の才夫 概分 (31) 水 t t y t) スペッグ (32) と 4 単 し、 写匠 トフンパ (33) と なが C の なまので あまので ままので ままので ままれ 記念でない。

生態の延年化。上記の名前にとるので、万以成何を通過する合成型気が管理的名によつて外貨で 報道に取貨作券的例を延長するので、その取組が 次を集けよっその例本が可、終品はその収をを紹 するによれてきる。

又、漁港中の気気は、液心力がによって無が突 数にとる差別で見の発生のかぞれ位まく、よって 発力されたよんじんとの間に火帯波をに均角する 単気振いて状態を呼の間をを単位に対よするとと ができ、又インシの発出を決めたるとともできる 質を使に倒れた保健である。

すらに食器が資本小部であるので食べた工場と より代い意味を気で温度されたつをおおらてあ る。

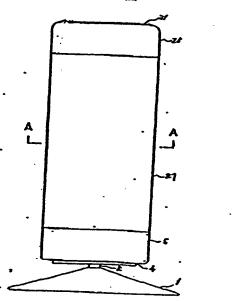
・・知済の信用を経せ

新工器柱型城隍、第二城柱平面堤。 满名 眼纹灰

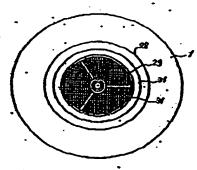
河南、成本館は第2月4一本地にかけら成ば前回、スコ河以内ヨーラ神にかけらの田田田田、東日市社会がある大田田民会園、東リ河大田民会園、東京園におびる内部大田田民会園、出き間におびる。
に対し、元田の、元田田にかける河域大田民会園である。

市场人 电电子 水流

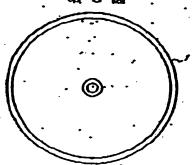
4月 RS1—30077 (9.



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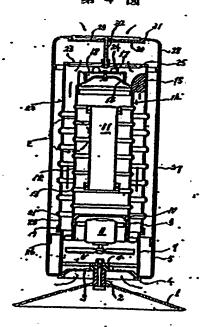


無3箇

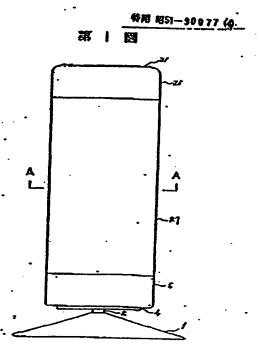


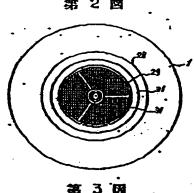
-400-

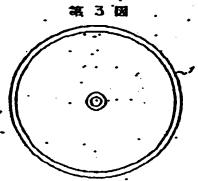
第 4 図

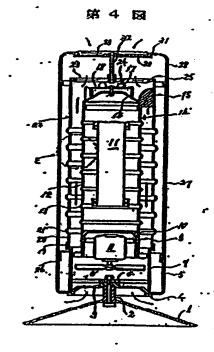


湖郊、 の 4 日 比 第 2 男 A ー A 神 K か け 3 以 所 間 日 、 ス ⇒ 河 以 月 ま 一 3 前 K か け 3 以 田 図 次、 収 e 母 比 在 6 元 か け 5 以 大 明 明 点 明 。 エ ナ 男 た 色 (水) 実 第 何 K か け 5 月 紙 大 所 可 起 点 点 。 本 8 日 比 写 (水)。 K 河 む 天 相 句 た か け 5 門 銭 大 所 質 e 説 歯 で う 5 。



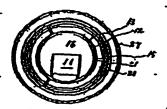


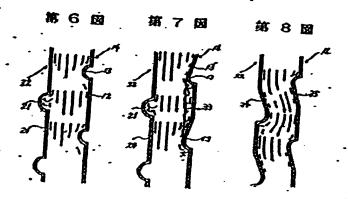




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